

CLAIMS

We claim:

1. A method for applying at least one substance to the inner surface of a bubble during blown-film extrusion, comprising the atomization of a fluid preparation of at least one substance at a point on the longitudinal axis of the bubble.
2. The method of claim 1, wherein atomization is performed by at least one atomizing apparatus affixed to the die mandrel of a blown-film extruder.
3. The method of claim 2, wherein the die and/or the die mandrel are modified to allow access to at least one atomizing apparatus from outside the bubble during extruder operation.
4. The method of claim 2, wherein at least one atomizing apparatus is a rotary atomization device comprising:
 - a) a rotating component, which can be any structure, substance or force field suitable to transfer or generate rotational force;
 - b) a cylindrical part mounted for rotation, with a rotational axis perpendicular to the surfaces of the cylindrical part that have a circular perimeter, the cylindrical part being rotated by the rotating component;
 - c) a conduit, which guides the fluid to one of the surfaces of the cylindrical part that have a circular perimeter, the conduit comprising at least one of the following:
 - c1) tubing;
 - c2) at least one channel in the die mandrel of the blown-film extruder;
 - c3) at least one channel in the rotating component;
 - c4) at least one channel in the cylindrical part.

5. The method of claim 4, wherein the atomization device further comprises at least one pumping apparatus coupled to the conduit, the pumping apparatus being any device suitable to impel the fluid through the conduit.

6. The method of claim 4, wherein the surface receiving the fluid on the cylindrical part is concave.

7. The method of claim 4, wherein the surface receiving the fluid on the cylindrical part has a central indentation where fluid is delivered without flow interruption.

8. The method of claim 4, wherein the cylindrical part is a disc.

9. The method of claim 4, wherein the conduit is thermally insulated, partially or on its entirety.

10. The method of claim 2, wherein at least one atomizing apparatus is a nozzle-based atomization device comprising:

a) a plurality of spraying nozzles oriented to atomize the fluid towards the inner surface of the bubble;

b) a central flow distributor to which the spraying nozzles are connected;

c) a conduit, which guides the fluid to the flow distributor, the conduit comprising at least one of the following:

c1) tubing;

c2) at least one channel in the die mandrel of the blown-film extruder.

11. The method of claim 10, wherein the atomization device further comprises at least one pumping apparatus coupled to the conduit, the pumping apparatus being any device suitable to impel the fluid through the conduit.

12. The method of claim 10, wherein the conduit is thermally insulated, partially or on its entirety.

13. The method of claim 1, where at least one substance is at least one of the following:

- a) a substance that prevents the film from sticking to itself;
- b) an antimicrobial substance;
- c) a deodorant;
- d) a substance that increases the electrical conductivity of the film;
- e) a substance that decreases the electrical conductivity of the film;
- f) a substance that absorbs electromagnetic radiation of selected wavelengths;
- g) a substance that reflects electromagnetic radiation of selected wavelengths;
- h) a fragrance or scent;
- i) a lubricant;
- j) a substance with oxidizing activity;
- k) a pesticide;
- l) a biocide;
- m) an animal attractant;
- n) a food preservative;
- o) an animal repellent;
- p) a rust inhibitor;
- q) a substance that decreases the surface tension of liquids;
- r) an adhesive substance;
- s) a drug;
- t) a hormone.

14. A blown-film extruder, comprising:

a) parts typical of a blown-film extruder, including, but not limited to:

- a1) at least one polymer feeder;
- a2) at least one extruder screw;
- a3) at least one die adapter;
- a4) a die, with a die mandrel and a die ring;
- a5) at least one air ring;

b) at least one atomizing apparatus affixed to the blown-film extruder at a location suitable for placing atomized material on the inner surface of a bubble during blown-film extrusion.

15. A blown-film extruder as described in claim 14, wherein at least one atomizing apparatus is affixed to the die mandrel of the blown-film extruder.

16. A blown-film extruder as described in claim 14, wherein at least one atomizing apparatus is a rotary atomization device comprising:

a) a rotating component, which can be any structure, substance or force field suitable to transfer or generate rotational force;

b) a cylindrical part mounted for rotation, with a rotational axis perpendicular to the surfaces of the cylindrical part that have a circular perimeter, the cylindrical part being rotated by the rotating component;

c) a conduit, which guides the fluid to one of the surfaces of the cylindrical part that have a circular perimeter, the conduit comprising at least one of the following:

c1) tubing;

c2) at least one channel in the die mandrel of the blown-film extruder;

c3) at least one channel in the rotating component;

c4) at least one channel in the cylindrical part.

17. A blown-film extruder as described in claim 14, wherein at least one atomizing apparatus is a nozzle-based atomization device comprising:

a) a plurality of spraying nozzles oriented to atomize the fluid towards the inner surface of the bubble;

b) a central flow distributor to which the spraying nozzles are connected;

c) a conduit, which guides the fluid to the flow distributor, the conduit comprising at least one of the following:

c1) tubing;

c2) at least one channel in the die mandrel of the blown-film extruder.

18. An improvement to a blown-film extruder to allow the application of at least one substance to the inner surface of a bubble during blown-film extrusion, comprising at least one atomizing apparatus affixed to the extruder at a location suitable for placing atomized material on the inner surface of the bubble during blown-film extrusion.

19. An improvement to a blown-film extruder as described in claim 18, wherein at least one atomizing apparatus is affixed to the die mandrel of the blown-film extruder.

20. An improvement to a blown-film extruder as described in claim 18, wherein at least one atomizing apparatus is a rotary atomization device comprising:

a) a rotating component, which can be any structure, substance or force field suitable to transfer or generate rotational force;

b) a cylindrical part mounted for rotation, with a rotational axis perpendicular to the surfaces of the cylindrical part that have a circular perimeter, the cylindrical part being rotated by the rotating component;

c) a conduit, which guides the fluid to one of the surfaces of the cylindrical part that have a circular perimeter, the conduit comprising at least one of the following:

c1) tubing;

c2) at least one channel in the die mandrel of the blown-film extruder;

c3) at least one channel in the rotating component;

c4) at least one channel in the cylindrical part.

21. An improvement to a blown-film extruder as described in claim 18, wherein at least one atomizing apparatus is a nozzle-based atomization device comprising:

a) a plurality of spraying nozzles oriented to atomize the fluid towards the inner surface of the bubble;

b) a central flow distributor to which the spraying nozzles are connected;

c) a conduit, which guides the fluid to the flow distributor, the conduit comprising at least one of the following:

c1) tubing;

c2) at least one channel in the die mandrel of the blown-film extruder.

22. A business related research and development method for determining how to modify a blown-film extruder to apply a substance to the inner surface of a blown bubble, comprising:

a) supplying a blown-film extruder; and

b) adding an atomizing apparatus to the blown-film extruder at a location suitable for placing atomized material on the inner surface of a bubble during blown-film extrusion.